

[0006] What is needed are systems and methods for performing operations upon data structures which reduce and/or eliminate the need to lock the data structure or the portion thereof being operated upon during the execution of concurrent operations.

- 5 Such systems and methods preferably reduce the time during which data structures operated upon are locked.

BRIEF SUMMARY OF THE INVENTION

A method for executing operations upon a linked data structure having at least one element includes performing a first set of operation tasks in a first phase in which the linked data structure is not locked. The first set of operation tasks is operable to effect a first set of state transitions characterized by navigation of at least an existing link of the linked data structure.

The method further includes developing a second set of operation tasks, the second set of operation tasks operable to effect a second set of element state transitions characterized by at least a pointer to the linked data structure. The second set of element state transitions is distinct from the first set of element state transitions and a portion of the linked data structure being operated upon by the operation is locked during the execution of the second set of operation tasks. The second set of operation tasks is performed in a second phase and instructions for carrying out the second set of operation tasks are executed atomically.

The system and method of the invention find particular implementation in the rebalancing of tree data structures. It has been found that the rebalancing of a tree data structure can be advantageously deferred. More particularly, the method of

the invention finds particular use in such deferred rebalancing including executing a first set of rebalancing operation tasks in the first phase and a second set of rebalancing operation tasks in the second phase.